UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/730,408	12/04/2000	Ross T. Casley	M-8167 US	7206

33031 7590 12/16/2004

CAMPBELL STEPHENSON ASCOLESE, LLP
4807 SPICEWOOD SPRINGS RD.
BLDG. 4, SUITE 201
AUSTIN, TX 78759

EXAMINER	
NGUYEN, ALAN V	
ART UNIT	**PAPER NUMBER**
2662	

DATE MAILED: 12/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/730,408	CASLEY ET AL.	
	Examiner	Art Unit	
	Alan Nguyen	2662	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiussi et al (US 5,689,506, hereafter Chiussi) in view of Somiya et al (US 6,438,107 B1, hereafter Somiya).

Referring to claims 1 and 26-28, Chiussi discloses a method of queue congestion control in a multi-stage switch, said multi-stage switch comprising at least one ingress line card, a plurality of switch elements arranged from a first switch element to a last switch element, and at least one egress line card (Fig. 11, col. 13, lns. 30-50), said method comprising: selectively enqueuing a data packet in an inbound queue in said ingress line card (co1. 9, lns. 20-31) dequeuing said data packet to said first switch element (col. 9, lns. 45-60); enqueuing said data packet in a first switch element queue in said first switch element; dequeuing said data packet to said last switch element (Fig. 3, col. 3, lns. 12-54) enqueuing said data packet in a last switch element queue in said last switch element, wherein said enqueuing comprises determining a backpressure signal (last queue status parameter, QSP, col. 13, lns. 60-68); dequeuing said data packet to said egress line card, (said dequeuing further comprising communicating said last QSP to said egress line card); enqueuing said data packet in an output queue (col.

10, lns. 29-45), said output queue having an output queue status (col. 14, lns. 55-64) wherein said method periodically combines said output queue status with said last QSP, forming a backpressure signal (col. 13, lns. 39-50). Chiussi does not expressly disclose that the backpressure signal is communicated from the last switch element in block '1133' in figure 11, to the output port cards '1150' Chiussi does teach forming a composite bitmap for all output ports and transmitting the information to each of the crossbar modules in figure 11 (col. 14, lns. 9-60). The congestion information is propagated from the later stages to the earlier stages (col. 13, lns. 63-co1. 14, lns. 3). Somiya discloses a system where the congestion of switches is indicated by monitoring the switches and transferring management cells indicating congestion status forward from the source to the destination where the data is then returned to the source to adjust the data rate (Fig. 1A, col. 1, lns. 65-co1. 2, lns. 16). The system of Chiussi could be modified so that the congestion control information is collected for each switching element and forwarded to the output port card, where the data is collected into a backpressure bitmap and transmitted to all switching elements and input cards. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with an output card receiving backpressure elements from the switching elements and forming a composite backpressure signal. One of ordinary skill in the art would have been motivated to do this since it would allow the input devices to receive congestion information on their downstream neighbors (toward the output card) by forming a single message to be transmitted from the output card to the switching elements and the input cards. This would allow a centralized

control instead of a distributed control as disclosed by Chiussi. A savings would occur in simplified circuitry in the switching elements since they would no longer be required to pass backpressure signals. Instead the switches would only receive the backpressure signals from a centralized control location.

Referring to claim 2, Chiussi discloses the method of Claim 1, wherein said selective enqueuing further comprises: determining an input queue status of said input queue (determine the delay priority and if there is data to be transmitted at that priority, col. 8, lns. 48-65); and combining said input queue status with said backpressure signal to determine said selectively enqueuing (col. 9, lns. 50-60).

Referring to claim 3, Chiussi discloses the method of Claim 1, wherein said last switch element queue comprises a plurality of queue elements and said QSP is based on a number of said queue elements in use in said queue (col. 13, lns. 3 1-50).

Referring to claim 4, Chiussi discloses the method of Claim 1, wherein said last switch element queue comprises a plurality of queue elements (col. 13, lns. 30-36), but does not expressly disclose said QSP is based on a fill rate of said plurality of queue elements. The system of Chiussi could be modified to monitor the status of the queue based on the fill rate of the queue. This can be accomplished by monitoring whether the size of the queue is increasing or decreasing. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with congestion determined by the fill rate of the queue. One of ordinary skill in the art would have been motivated to do this since monitoring the fill rate allows the system to adaptively increase/decrease the transmission rate based upon whether the

queue is becoming more/less congested. Using this technique allows the system to adjust before an overflow/underflow condition exists.

Referring to claim 5, Chiussi discloses the method of Claim 1, wherein said backpressure signal has more than two discrete states (col. 14, lns. 10-16). The backpressure signal is formed into a backpressure bitmap indicating the states of the multiple output ports.

Referring to claim 6, Chiussi discloses the method of Claim 1, wherein said communicating said backpressure signal uses in-band signaling (col. 14, lns. 35-60).

Referring to claim 7, Chiussi discloses the method of Claim 1, wherein said communicating said backpressure signal uses out-of-band signaling (col. 14, lns. 33-42).

Referring to claim 8, Chiussi discloses the method of Claim 1, wherein for a plurality of switch elements: each said enqueuing in a switch element comprises determining a local QSP (at the switch element) and combining said local QSP with a prior QSP communicated from a prior switch element to form a new QSP (form a composite congestion bitmap); each said dequeuing to a next said switch element further comprises communicating said new QSP to said next switch element (see claim 1 for reasoning to transport the congestion data form the input stages to the through the switch to the output stages for forming a composite congestion message of all switching and input/output cards).

Referring to claim 9, Chiussi discloses the method of Claim 8, wherein said plurality of switch elements comprises all said switch elements in said multi-stage switch (Fig. 11).

Referring to claim 10, Chiussi discloses the method of Claim 8, wherein said last switch element queue comprises a plurality of queue elements and said determining a switch elements backpressure (local QSP) is based on a number of said queue elements in use in said queue (col. 13, lns. 30-50).

Referring to claim 11, Chiussi discloses the method of Claim 8, wherein said last switch element queue comprises a plurality of queue elements (col. 13, lns. 30-50), but does not expressly disclose said determining a local QSP is based on a fill rate of said plurality of queue elements. The system of Chiussi could be modified to monitor the status of the queue based on the fill rate of the queue. This can be accomplished by monitoring whether the size of the queue is increasing or decreasing. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with congestion determined by the fill rate of the queue. One of ordinary skill in the art would have been motivated to do this since monitoring the fill rate allows the system to adaptively increase/decrease the transmission rate based upon whether the queue is becoming more/less congested. Using this technique allows the system to adjust before an overflow/underflow condition exists.

Referring to claims 12 and 25, Chiussi discloses an apparatus for controlling queue congestion in a multi-stage switch, said multi-stage switch comprising at least one ingress line card, a plurality of switch elements arranged from a first switch element

to a last switch element, and at least one egress line card (Fig. 11), comprising: an ingress line card comprising circuitry to selectively enqueue a data packet in an inbound queue (col. 9, lns. 20-45) said first switch element, into which said ingress line card dequeues said data packet, comprising circuitry to enqueue said data packet in a first switch element queue (Fig. 3, 11, col. 13-55); said last switch element, into which an upstream switch element dequeues said data packet, comprising circuitry to enqueue said data packet in said last switch element queue (col. 3, lns. 13-55) and determine a backpressure bitmap (last queue status parameter, QSP, col. 13, lns. 30-50)) and said egress line card, into which said last switch element dequeues said data packet (and communicates said last QSP), comprising: circuitry to enqueue said data packet in an output queue (col. 10, lns. 29-45), said output queue having an output queue status (col. 14, lns. 55-60) circuitry to combine said output queue status with said last QSP to periodically form a backpressure signal (col. 14, lns. 55-60); (and circuitry to communicate said backpressure signal to said ingress line card), wherein said circuitry to selectively enqueue said data packet in said ingress line card is influenced at least in part by said backpressure signal (Fig. 2, col. 9, lns. 50-60). Chiussi does not expressly disclose that the backpressure signal is communicated from the last switch element in block '1133' in figure 11, to the output port cards '1150.' Chiussi does teach forming a composite bitmap for all output ports and transmitting the information to each of the crossbar modules in figure 11 (col. 13, lns. 30-50, col. 14, lns. 9-60). The congestion information is propagated from the later stages to the earlier stages (col. 13, lns. 63-col. 14, lns. 3). Somiya discloses a system where the congestion of switches is indicated by

monitoring the switches and transferring management cells indicating congestion status forward from the source to the destination where the data is then returned to the source to adjust the data rate (Fig. 1A, col. 1, lns. 65 - col. 2, lns. 16). The system of Chiussi could be modified so that the congestion control information is collected for each switching element and forwarded to the output port cards where the data is collected into a backpressure bitmap and transmitted to all switching elements and input cards. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with an output card receiving backpressure elements from the switching elements and forming a composite backpressure signal. One of ordinary skill in the art would have been motivated to do this since it would allow the input devices to receive congestion information on their downstream neighbors (toward the output card) by forming a single message to be transmitted from the output card to the switching elements and the input cards. This would allow a centralized control instead of a distributed control as disclosed by Chiussi. A savings would occur in simplified circuitry in the switching elements since they would no longer be required to pass backpressure signals. Instead the switches would only receive the backpressure signals from a centralized control location.

Referring to claim 13, Chiussi discloses the apparatus of Claim 12, wherein said circuitry to selectively enqueue said data packet further comprises: circuitry to determine an input queue status (determine if the queue is empty at a certain delay priority, col. 9, lns. 50-60); and circuitry to combine said input queue status with said

backpressure signal to influence said circuitry to selectively enqueue said data packet (col. 9, lns. 50-60).

Referring to claim 14, Chiussi discloses the apparatus of Claim 13, wherein said circuitry to combine said input queue status with said backpressure signal further comprises a state machine (col. 6, lns. 25-34).

Referring to claim 15, Chiussi discloses the apparatus of Claim 12, wherein each said queue comprises a plurality of queue elements and said QSP is based on a number of said queue elements in use in said queue (col. 13, lns. 30-50).

Referring to claim 16, Chiussi discloses the apparatus of Claim 12, wherein each said queue comprises a plurality of queue elements (col. 13, lns. 30-50), but does not expressly disclose said QSP is based on a fill rate of said plurality of queue elements. The system of Chiussi could be modified to monitor the status of the queue based on the fill rate of the queue. This can be accomplished by monitoring whether the size of the queue is increasing or decreasing. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with congestion determined by the fill rate of the queue. One of ordinary skill in the art would have been motivated to do this since monitoring the fill rate allows the system to adaptively increase/decrease the transmission rate based upon whether the queue is becoming more/less congested. Using this technique allows the system to adjust before an overflow/underflow condition exists.

Referring to claim 17, Chiussi discloses the apparatus of Claim 12, wherein said backpressure signal has more than two discrete states. The backpressure signal monitors the states of multiple queue (col. 13, lns. 30-50).

Referring to claim 18, Chiussi discloses the apparatus of Claim 12, wherein said circuitry to communicate said backpressure signal uses in-band signaling (col. 14, lns. 55-60).

Referring to claim 19, Chiussi discloses the apparatus of Claim 12, wherein said circuitry to communicate said backpressure signal uses out-of-band signaling (col. 14, lns. 33- 36).

Referring to claim 20, Chiussi discloses the apparatus of Claim 12, having a plurality of switch elements, each of said plurality of switch elements comprising: circuitry to determine a local QSP; circuitry to combine said local QSP with a prior QSP communicated from a prior switch element to form a new QSP; and circuitry to communicate said new QSP to said next switch element (col. 13, lns. 30-50). The backpressure status signals are propagated from the output card to the input card through the switches. The backpressure signals are used to identify which elements in the system are congested.

Referring to claim 21, Chiussi discloses the apparatus of Claim 20, wherein said plurality of switch elements comprises all said switch elements in said multi-stage switch (Fig. 11) .

Referring to claim 22, Chiussi discloses the apparatus of Claim 20, wherein each said queue comprises a plurality of queue elements and said local QSP is determined based on a number of said queue elements in use in said queue (col. 13, lns. 30-50).

Referring to claim 23, Chiussi discloses the apparatus of Claim 20, wherein said each said queue comprises a plurality of queue elements (col. 13, lns. 30-50) but does not expressly disclose said local QSP is determined based on a fill rate of said plurality of queue elements. The system of Chiussi could be modified to monitor the status of the queue based on the fill rate of the queue. This can be accomplished by monitoring whether the size of the queue is increasing or decreasing. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with congestion determined by the fill rate of the queue. One of ordinary skill in the art would have been motivated to do this since monitoring the fill rate allows the system to adaptively increase/decrease the transmission rate based upon whether the queue is becoming more/less congested. Using this technique allows the system to adjust before an overflow/underflow condition exists.

Referring to claim 24, Chiussi discloses the apparatus of Claim 20, wherein said circuitry to combine said local QSP with a prior QSP further comprises a state machine (col. 6, lns. 25-35).

Response to Arguments

3. Applicant's arguments filed 25 June 2004 have been fully considered but they are not persuasive. Regarding claim 1 Applicant states that the Chiussi reference (US

5689506) fails to disclose combining an output queue status from the output card with a last QSP (queue status parameter) from the last module in the fabric, and communicating a last QSP to an egress line card. Applicant further states that the Somiya reference (US 6438107) does not disclose communicating the last QSP to an egress line card. The Examiner respectfully disagrees. Chiussi discloses in col 14 lines 33-51, a backpressure information that is utilized to ensure lossless operation. Chiussi discloses a queue status parameter QSP (a backpressure status bit is used to provide feedback on the queues of the modules in the fabric; see col. 13 lns. 35-50). Chiussi also discloses an output queue status (Each output port card provides backpressure status; see col. 14 lns. 55-60). Chiussi discloses forming a composite bitmap for all output ports and transmitting the information to each of the crossbar modules from the input stage through the fabric and onto the output stage/output card in figure 11 (col. 13, lns. 30-50, col. 14, lns. 9-60). Although Chiussi does not expressly disclose that the backpressure signal is communicated from the last switch element in block to the output port cards '1150', Somiya does disclose a system that transfers management cells indicating congestion status forward from the source to the destination where the data is then returned to the source to adjust the data rate (Fig. 1A, col. 1, lns. 65-col. 2, lns. 16). Therefore, it would have been obvious to one of ordinary skill in the art to combine the system of Chiussi, with an output card receiving backpressure elements from the switching elements and forming a composite backpressure signal. One of ordinary skill in the art would have been motivated to do this since it would allow the input devices to receive congestion information on their downstream neighbors (toward the output card)

by forming a single message to be transmitted from the output card to the switching elements and the input cards. This would allow a centralized control instead of a distributed control as disclosed by Chiussi. A savings would occur in simplified circuitry in the switching elements since they would no longer be required to pass backpressure signals. Instead the switches would only receive the backpressure signals from a centralized control location.

Applicant states that there is no motivation for the combination and that it would not have been obvious to one of ordinary skill in the art to modify the system of Chiussi to communicate congestion information from a last switch. The Examiner respectfully disagrees. The motivated to combine would have been obvious since it would allow a centralized control because the input devices to receive congestion information on their downstream neighbors (toward the output card) by forming a single message to be transmitted from the output card to the switching elements and the input cards. This would allow a centralized control instead of a distributed control as disclosed by Chiussi. A savings would occur in simplified circuitry in the switching elements since they would no longer be required to pass backpressure signals. Instead the switches would only receive the backpressure signals from a centralized control location. It is concluded that the Chiussi reference in combination with the Somiya reference in their entirety continue to read on the claimed subject matter (clms. 1-28) through obviousness. Therefore the claims are not allowed over the prior art.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Nguyen whose telephone number is 571-272-3089. The examiner can normally be reached on 9am-6pm ET, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on 571-272-3088. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9314.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AVN
December 6, 2004

HASSAN KIZOU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600